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**STRATEGIES FOR
ELECTRONIC INTEGRATION:
FROM ORDER-ENTRY TO VALUE-ADDED
PARTNERSHIPS AT BAXTER**

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Strategies for Electronic Integration: From Order-Entry to Value-Added Partnerships at Baxter

Abstract

The Analytical Systems Automated Purchasing (ASAP) system developed by American Hospital Supply Corporation (AHSC) in the early 1960s is one of the best-known, most often-cited strategic information systems, exemplifying what we now refer to as the potential strategic role and capabilities of information technology. However, the knowledge and strategic implications of this system are scattered across varying sources, including personal anecdotes, columns in the popular press and pedagogical cases. This paper offers a more systematic analysis of the interrelationships among the organizational, marketplace, and competitive characteristics of the system from its early inception to current status. Specifically, it argues that this evolution can be best viewed in terms of two eras, and the first era consisted of three phases: localized experimentation; organizational assimilation; and competitive jockeying. The second era -- distinguished by a redefined relationship between Baxter and its customers, as well as a fundamental shift in technology away from dedicated, customer-supplier, electronic order entry, and towards a multivendor electronic infrastructure -- is now emerging. This raises significant challenges from a business perspective in how to leverage information technology to redefine the fundamental roles and relationships among players in the business network.

Key Words: Interorganizational systems; information technology; strategic advantage; business strategy; electronic integration; ASAP system; ValueLink.

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Introduction

Information technology (IT)¹ is emerging as a key force in shaping the basis of competition in many markets. Information systems (IS) have long been considered central for effective management, but recent interest in IT is based on its potential to influence the drivers of competition. The subject of IT and its potential role for strategic advantage has been largely dominated by conceptual frameworks (e.g., McFarlan, 1984; Porter and Millar, 1985; Barrett and Konsynski, 1982; Cash and Konsynski, 1984; Johnston and Vitale, 1988; Wiseman, 1985). There is also a growing set of popular examples and applications such as: McKesson's *Economost* system, American Airlines' *SABRE* reservation system, Baxter's (previously American Hospital Supply Corporation, AHSC) *ASAP* system, Merrill Lynch's *Cash Management Account*, and Otis Elevators' *Otisline*.

Since systematic theory development is just beginning in this area, we argue here that a careful delineation of the relationships among the structure of firm-to-firm competition, the characteristics of major players competing in the marketplace, the nature of the products and services delivered, and the role of interorganizational information systems (IOS) is necessary to better understand the strategic role of IT. Towards this end, three strands of research are promising: (a) theoretical articulation of the centrality of IT in competitive terms (see for instance, Bakos, 1987; Malone, Yates, and Benjamin, 1987; Rotemberg and Saloner, 1989); (b) empirical assessments of the impact of IT on the nature of business relationships (see for instance, Venkatraman and Zaheer, 1990; Zaheer and Venkatraman, 1990); and (c) detailed cases which describe and analyze the role of IT in the larger context of organizational and marketplace characteristics (see for instance, Copeland and McKenney, 1988; Clemons and Row, 1988; Clemons and Weber, 1989; Clemons, 1989; Harris and Katz, 1988).

This paper falls within the third category and seeks to provide a more detailed analysis of the role of *ASAP* in supporting and shaping Baxter's business strategy as well as its impact on the competitive characteristics of the hospital services marketplace. Although this particular system is widely discussed, much of what is available is either anecdotal (see for instance, *Business Week*, 1986; Petre, 1985) or written for pedagogical purposes (Harvard Business School, 1985; 1988). Following Bonoma (1985), we distinguish between cases for pedagogical purposes and cases for research purposes.

Background and Approach

Baxter International Inc. entered the 1990s with a \$7.4 billion worldwide sales base, up 7.8% from the company's 1988 sales of \$6.9 billion. Baxter's core businesses operate within four industry segments: Hospital Products and Services, Medical Services and Specialties, Alternate Site Products and Services, and Industrial Products.² The hospital supply division is the largest business within Baxter, representing 52% of sales, up 5.7% to \$3.8 billion in 1989. The alternate site business is the fastest growing, up 19% to \$1.5 billion in 1989, representing roughly 20% of total sales. Medical systems and specialties account for 22% of total sales, and industrial products 6.0%.³

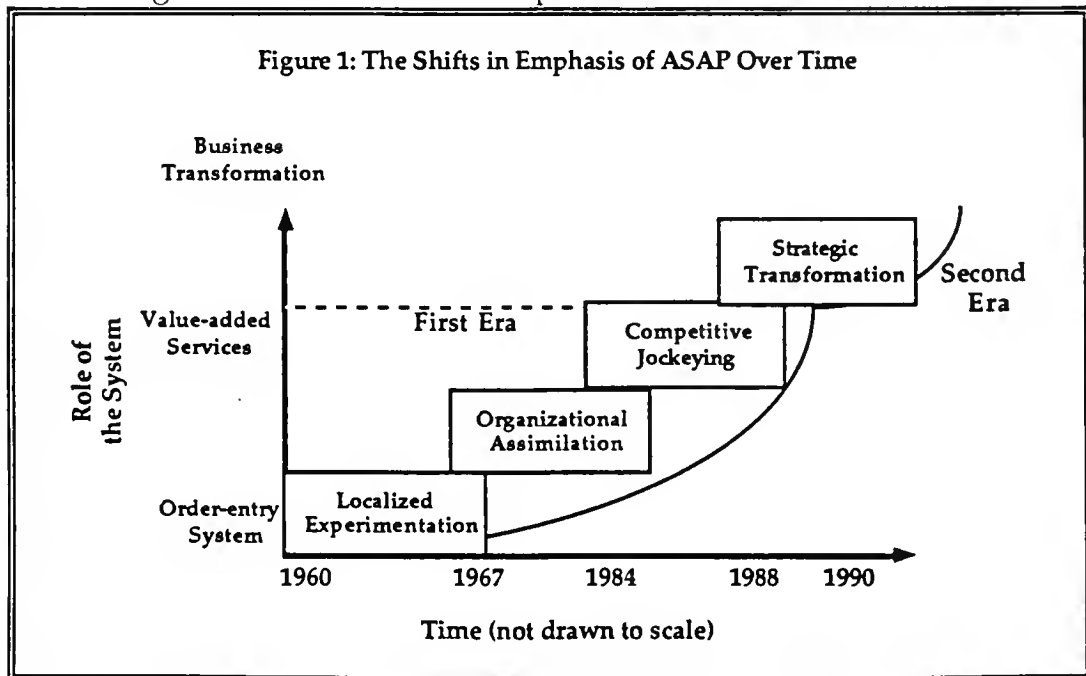
Baxter International was formed in the 1985 merger of American Hospital Supply Corporation with Baxter Travenol Laboratories. The merger positioned Baxter as the largest single source of healthcare products in the industry. Baxter develops, manufactures, or distributes more than 120,000 products for use in hospitals, laboratories, blood and dialysis centers, nursing homes, and at home. For a typical hospital customer, Baxter can provide over 70% of the hospital's supply needs. For blood and/or dialysis centers, Baxter can supply essentially 100% of their needs.

Analytic Systems Automatic Purchasing (ASAP) – a computerized system for ordering, tracking and managing supplies, traces back to 1957. At that time, the American Hospital Supply Corporation (AHSC) began to automate its internal order entry and billing procedures by installing IBM 632 tab-card billing machines in its distribution centers.⁴ What began then as an internal move to automate the company's distribution function expanded in the 1960s and 1970s to become one of the first, and one of the most successful, supplier-to-customer electronic linkages in the industry. Below we describe and classify the development and evolution of the ASAP system into two distinct eras. Our review and case analysis has involved numerous interviews with Baxter and former AHSC personnel over the last two years, archival studies of corporate reports and other secondary sources, and interviews with hospital customer and other healthcare suppliers. Appendix 1 provides a brief description of our methodology.

The Evolution of the ASAP System

Overview

We describe and classify the development and evolution of the ASAP system into two eras. The first era consists of three phases: (I) *Localized Experimentation* -- representing AHSC's initial, experimental attempts to respond to market needs for efficient distribution through the use of computerized systems and communication capabilities; (II) *Organizational Assimilation* -- representing AHSC's business strategy to leverage the ASAP system through aggressive penetration and diffusion within its hospital customer base as a central and unique means of exchange between itself and its customers; and (III) *Competitive Jockeying* -- reflecting the actions by AHSC/Baxter, as well as its competitors, to control the electronic channels of distribution and the contrasting pressures from hospital customers to evolve towards a multi-vendor, universal distribution system. In the second era, both Baxter and the entire hospital services marketplace are on the threshold of a major *strategic transformation* -- where critical strategic questions relate to the use of proprietary versus common technology platforms, as well as redefinitions of the roles of the critical players in the marketplace. Figure 1 is a schematic representation of the three phases of the first era and the emerging second era. The ensuing discussion is organized in terms of these phases.



Phase One: Localized Experimentation

The Trigger. In the 1950s and early 1960s, the typical ordering process between a hospital and its supply firm was the responsibility of an individual salesperson. This salesperson either mailed or phoned in the order to the supply firm's distribution center for delivery, a paper-intensive and expensive process. In 1957, AHSC's automation initiatives focused on reducing the costs of the order-entry and billing process at the firm's distribution centers through the deployment of IBM tab-card machines. In this sense, AHSC's early initiatives followed an emerging management practice to reduce costs through selective automation. The critical turning point from a business transformation point of view, however, was the shifting of the order-entry process out of AHSC's distribution center into the purchasing department of the customer.

Servicing Stanford Medical Center. In 1963, one of AHSC's West Coast offices was experiencing difficulties in serving Stanford Medical Center with timely and accurate delivery of hospital products. Stanford had adopted a unique numbering system in their product categories to create a common numbering scheme for internal purposes, but these categories were inefficient when orders were placed over the telephone with different suppliers. Frank Wolfe, a manager in the AHSC West Coast Office, arrived at a simple solution to improve efficiency: prepunched cards at the Stanford purchasing departments -- with the punched holes corresponding to AHSC's numbering scheme -- and a handwritten number (with a marker pen) corresponding to the Stanford numbering scheme. The ordering clerks could then thumb through their set of cards and select the cards they wanted (based on the handwritten numbers provided by Mr. Wolfe), and then process these cards through an IBM 1001 Dataphone attached to an IBM 026 card punch at AHSC's office (Steiner, 1988).

While hospital clerks selected cards based on their own internal numbering scheme, the availability of pre-punched cards from AHSC not only increased the efficiency in order processing (i.e., less errors), but also insured that the required items were ordered only from AHSC since the prepunched cards had only the AHSC numbering scheme. This system was called *Tel-American*. As Carl Steiner, then with AHSC, and now Vice President, Baxter Corporate Information Resources, noted: "this first step was not the result of any top-down strategic directive to leverage information technology; it was simply the result of a manager at AHSC doing his job -- assuring the timely and accurate delivery of our products to our customer⁵." This first phase, therefore, can be summarized as:

p an operational, localized response by a customer-oriented organization to improve product delivery and service quality to an individual customer.

Phase Two: Organizational Assimilation

Recognition and Response. AHSC's successful exploitation of the early Tel-American system rested on the early *recognition* of the potential of this automated order entry process to support its business strategy, and the corresponding set of organizational *responses* to build the required business process and technological infrastructure to capitalize on the opportunities afforded by greater customer integration. Many executives within the old American Hospital Supply Corporation believe that the critical turning point came during a 1966 corporate strategic planning exercise. Steiner recalled that: "During that meeting, the business managers decided to allocate IS resources to the marketing and distribution activities rather than enhancing the capabilities of the administrative systems, such as payroll, accounts payable and accounts receivable⁶." This decision marked a view that the IT infrastructure was central to driving distribution, thus committing IT resources as *investments* rather than as administrative *expenses*. It was supported by centralized coordination and commitment by senior management. AHSC's corporate Information Systems Division (ISD) was given responsibility for the design, development and modification of the *Tel-American* system as well as 'make-versus-buy' decisions⁷ in key technologies.

The commitment shown by senior management to leverage IT capabilities played an important role in this phase. While local experimentation could be carried out with minimal resources, the continuation of the *Tel-American* system required not only financial resources but also senior management support. CEO involvement was key to the successful transformation from local experimentation, phase one, to the next phase, where IT and *Tel-American* functioned as one anchor in AHSC's strategy of differentiation in the marketplace. AHSC's chairman, Karl Bays, who was quoted later in 1985 as saying "The computer is at the heart of our success," himself participated in regular, two hour monthly meetings of his IS and *Tel-American* staff. These meetings provided encouragement as well as informed Bays and his staff on the success of the program⁸.

Continuing System Enhancements. A second important element of this phase was the continuous, dynamic alignment between customer needs and the

adaptation of technological and business process functionalities. The experimental *Tel-American* system evolved into an ordering system supporting order entry through a touch-tone phone -- known as ASAP 1. In this case, the customer would simply call an AHSC distribution center, and "key in" the order. Although this system proved to be a revolution of order-processing, a major limitation of ASAP 1 was its inability to directly interconnect AHSC, its sales representatives and hospital customers, and its inability to provide printed copies for order verification. Customer requirements led to the next major enhancement, ASAP 2 -- teletype machines at customer sites for order input and printing copies of orders for verification and administrative purposes. The customers paid for the terminals, while AHSC incurred the telephone charges.

In contrast to ASAP 2's purely technical improvements, ASAP 3 was focused on *customizing* the system to the specifications and requirements of different hospitals. For example, ASAP 3 allowed hospitals to order supplies using their own internal stock numbers, and to create standing order files for regular ordering. In this way, economic order quantities for different items could be incorporated into the system, facilitating quicker execution of the ordering process. Similarly, from the output perspective, customers could specify their purchase-order formats and avoid multiplicity of formats. These capabilities proved to be major differentiators. Most hospitals had not automated their materials management and supply functions by the early 1970s, and could not have designed and developed such an electronic ordering system without incurring significant costs.

Thus, ASAP 3 was introduced in direct response to the hospitals' steadily increasing needs to improve their own internal management of supplies. A significant aspect of AHSC's service-level strategy was to work with the hospitals to define, measure and improve the non-product related costs of materials management.⁹ This was a new emphasis in the industry.

This emphasis led AHSC by the mid 1970s to begin providing to select hospitals Customer Purchase Analysis reports - essentially reports showing historical ordering patterns for supplies, but also including information which could be used to determine economic order quantities and other materials management-like functions. For a few larger customers, AHSC put together small teams of sales, marketing, distribution and IS personnel to analyze the hospital's paper flow around materials ordering and receiving. These types of services were later incorporated into the firm's broader value added services approach.¹⁰

The point to be made here was that AHSC responded to the needs of a few, "leading-edge" customers in the beginning, but this service level requirement rapidly diffused throughout the industry, and became a *necessary* service for all customers by the 1980s (see discussion of second era). As Michael Heschel, former CIO at AHSC and Baxter International noted: "These early reports and services back to the hospitals were part of a large overall strategy to work with the customer in advancing the purchasing function within the hospital (it had been a very clerical-like function in most cases). We felt it should be a materials management function. We knew that working with them in this way would bring good value to the hospital and create within the hospital someone who would appreciate our services¹¹."

Table 1: A Summary of Continuous System Enhancements

System (Date Introduced)	Distinctive Features	Technology at Hospitals	Technology at AHSC
Tel-American (1963)	Reduced costs of ordering; increased possibility of ordering with AHSC	handwritten, pre-punched IBM cards	IBM card reader connected to a telephone line
ASAP 1 (1967)	Streamlined Order entry; enhanced possibility of ordering with AHSC	touch-tone telephone; bar code reader; pre-punched cards – focus on ease-of-use and low cost	IBM card reader connected to a telephone line; system capable of receiving touch-tone instructions
ASAP 2 (1970s)	Confirmation of orders; Printing of orders for verification; continued possibility of ordering with AHSC	ASAP 1 plus teletype for obtaining printed outputs for verification	Same as ASAP 1
ASAP 3 (1981)	Customization of system to individual hospital requirements; customer-oriented	Terminals, barcode readers depending on hospital's internal systems	Same as ASAP 1 with major application systems development
ASAP 4 (1983)	Accelerated processing and integrated materials processing	Mainframe link with AHSC	Five Burroughs mainframes linked to internal systems to provide a fuller menu of services

In 1983, ASAP 4 was introduced to respond to requests from hospitals to provide direct computer-to-computer links. This version of ASAP simplified the hospital's purchasing process by eliminating all the manual steps required except the approval of purchases. By requiring specialized linkages (i.e., protocols) and tailored hospital-to-supplier purchasing procedures, ASAP 4 resulted in a closer interconnection between AHSC and the hospitals, thus increasing the asset-

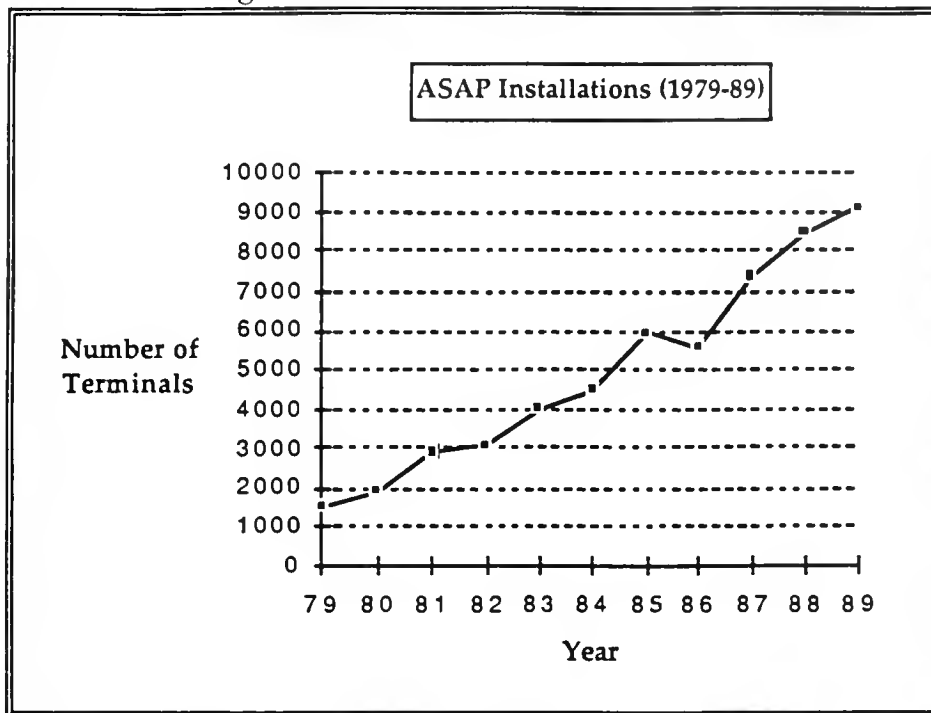
specificity of exchange¹². Table 1 provides a summary of the continuing enhancements from *Tel-American* to ASAP 4.

While our discussion to this point has focused on AHSC's activities internal to its organization, our next two themes address their initiatives in the marketplace.

Preemptive Penetration of Hospitals. AHSC's major initiative in the marketplace was the aggressive penetration of the hospital community with ASAP to gain relative competitive edge over other suppliers. In the 1960s and early-to-mid 1970s, hospitals were moving from a focus on service level quality to a focus on service level quality and cost. This period was marked by a major increase in the demand for hospital services, due in large part to the passage of Medicaid and Medicare legislations in 1965 and 1966. By 1971, hospital care was the fastest growing component of health spending, largely attributable to "greater government funding" and "sales of medical supplies and equipment that were growing at 10% annually" (Standard & Poor, 1971; June 24, 1971). Indeed, over the period 1970-1987, industry sales grew at over 16% compound average nominal rate, with total sales moving from \$2.14 billion in 1970 to \$22.5 billion in 1986.

As we have noted previously, early *Tel-American* and ASAP versions provided purchase history and usage reports to hospitals for internal purposes, and later versions provided more materials management-like reporting and analysis. These reports proved to be strong inducements for hospitals to sign up. Approximately 200 hospitals worked with AHSC to install ASAP 1 systems within the first few years of its introduction, and by the mid 1970s, over 500 hospitals were ASAP or *Tel-American* customers. Indeed, first mover advantages¹³ generally accrue due to technological leadership and/or preemption, and the rapid diffusion of ASAP 1 into the company's customer base illustrates this point. Figure 2 profiles the aggressive pattern of penetration of ASAP terminals into the marketplace (including terminals provided to AHSC sales teams for customer support).

Figure 2: ASAP Installations (1979-1989)



Source: *Baxter Internal Records*

Attainment of 'Prime Vendor' Status. Our final point to be made in this phase relates to AHSC's strategy of achieving "prime vendor of choice" for the hospitals (e.g., a "one stop shopping" supplier). Early on, it was clear to AHSC management that while there would be first-mover advantages through successive introductions of ASAP, the technology itself was a relatively small part of the means to differentiate itself from other suppliers, and not an end in itself. Indeed, several regional competitors had themselves introduced small, *Tel-American*-like systems in a few hospitals (Owens & Minor and Durr-Fillauer were two examples). These companies, however, had failed to move aggressively in installing these systems across a wide base of customers.¹⁴ Thus, while ASAP customers benefitted from a reduction in the cost of order processing and materials management, the feeling among AHSC management was that the technology could be imitated by competitors - it was the one stop shopping approach, supported by AHSC's broad product line, which could not. As Carl Steiner noted: "Our whole approach at the time, pushed by Gary Nei (AHSC product manager for systems marketing) and supported by marketing up to and including AHSC's Chairman Karl Bays, was that we had a broad enough product line to become the hospital's prime vendor of choice. The systems were really thought of as the way to show this to the customer,

and - even better - to provide improved service (lower error rates, reduced processing costs) on top of that."¹⁵

Thus, AHSC's two-pronged strategy rested on the company's ability to leverage their extensive product scope *and* the ASAP technology platform to market the concept of 'prime vendor' to the hospitals. From the hospital's point of view, while unit prices of most items in AHSC's offering were competitive with other suppliers, their total costs of materials management included an administrative component that was directly proportional to the number of different orders placed. Hence, the hospitals preferred a 'prime vendor' – this arrangement would reduce their administrative overhead; and AHSC was well positioned with ASAP to fill this role. Moreover, given that AHSC manufactured less than 30% of the products it carried, the firm's business scope was viewed by customers as more distribution-oriented than manufacturing. Consequently, AHSC's strategy of 'one-stop shopping' was more favorably viewed by the hospitals – it was less a question of a manufacturer trying to increase product sales, than a distributor moving to broaden its product line and reduce costs by increasing volume.¹⁶ In sum, the extensive product-scope (representing a combination of self-manufactured products and outsourced products) coupled with an efficient order-entry system allowed AHSC to rapidly penetrate the hospital community.

Further, it is important to note that AHSC's ability to deliver a full-line of products as well as augmented service through customized information reporting on materials management could not have been formulated nor implemented effectively without the information available via the ASAP platform. To reiterate, although ASAP's technological capabilities reduced the hospital's administrative costs of ordering, this could be imitated. On the other hand, the ability of AHSC to provide the product line necessary for "one stop shopping" *and* the systems capability to provide service-level reports and delivery schedules on these products emerged as a key differentiator. In this vein, Venkatraman and Kambil (1990) have observed that the power of electronic integration lies in the firm's ability to creatively manipulate the information attributes of exchange (e.g., information on why the product was ordered in the first place, in addition to data on the simple exchange of product and money). This in turn marks the opportunity for the firm to redefine the nature of the business relationship between itself and the customer.

p Thus, phase two is characterized by the *responsiveness of the firm's internal marketing, distribution and IS functions, the firm's*

technological capabilities, and the preemptive penetration of hospitals through the attainment of "prime vendor" status, building on broad product scope and the creative leveraging of information attributes.

Phase Three: Competitive Jockeying

Delayed Competitive Response: Regional Fragmentation or Inertia Barriers?

What were AHSC's competitors doing as the firm consolidated its penetration of the hospital marketplace? The answer lies in the recognition of two major factors: (a) *fragmented, regional competition* -- whereby the smaller players could not effectively provide similar systems, service level, and product support; and/or (b) *inertia barriers* -- whereby competitor-specific characteristics (such as other priorities; organizational/structural idiosyncrasies whereby no one business group or area had the direct responsibility to respond; as well as administrative procedures and bureaucratic policies¹⁷) slowed their abilities to respond effectively.

Fragmented Competition. The hospital supply market was highly fragmented in the 1970s and early 1980s. In 1972, Standard & Poor's report noted that over 70% of producers had fewer than 50 employees per plant (Standard & Poor, 1972; June 22, 1972). Table 2 summarizes the relative market positions, highlighting the degree of fragmentation.

Table 2: Relative Market Positions (%) 1982-1985

Category	Firms	1982	1984	1985
National	AHSC	25.0	26.8	24.7
	Whittaker General Medical	7.7	5.7	5.9
	Bergen-Brunswig	3.1	3.8	5.3
	Medline	1.6	1.9	1.9
Regional	Owens & Minor	3.3	4.0	4.3
	Burrows	3.2	3.7	3.9
	Durr-Fillauer	1.6	2.5	2.5
Local	Hospital Services & Supplies	1.6	2.2	0.7
	White & White, Inc.	0.6	0.6	0.7

Source: *Health Industry Today*, February 1986; page 21.

It was into this environment, therefore, that Durr-Fillauer, a regional hospital supply company in Southeast USA, and a direct AHSC competitor, introduced a Tel-American/ASAP 1 like system in the mid 1970s. At about the same time, *Van Waters & Rogers* (VWR), a local competitor in the specialty products segment on the West Coast, introduced a similar order entry system. Both systems, however, never constituted much of a threat. AHSC had established its service-level and product position in the marketplace for over ten years, and offered equal (if not

better) order entry system functionality. Thus, even when Whittaker General Medical, AHSC's largest competitor, introduced ADAMM in the late 1970s, an electronic order entry system similar to ASAP, AHSC's position in the marketplace was not fundamentally weakened. AHSC -- by virtue of its continuing upgrading of ASAP -- continued to dominate the market.

It is interesting to note that at the same time, a suit was filed in the Western District of Michigan Federal court by *White & White, Inc.*, a regional competitor, in party with several other distributors. The suit charged AHSC with unfair trade practices, and was decided initially in favor of the plaintiffs. AHSC appealed the decision, and the US Court of Appeals for the Sixth District, Michigan reversed the decision¹⁸, ultimately finding for the defendant in December of 1983¹⁹.

To summarize: AHSC benefitted from a fragmented, hospital services marketplace at the regional level, and was able to aggressively penetrate the hospital market with its broad product offering and systems support. Regional-level responses -- when initiated -- were too limited and too weak to pose a major threat to AHSC. If we compare this to the McKesson case, the key difference appears to be that McKesson had a large national-level competitor, Bergen-Brunswig, who realized that a delayed, weak response to *Economost* would result in the erosion of their competitive position. Although Bergen-Brunswig is not typically included in the set of leading examples of strategic information systems, it is important to note that they responded quickly to neutralize the benefits accrued to McKesson due to the *Economost* system (Clemons and Row, 1988).

Inertia. The question is: 'what was the pattern of response from the major hospital supply competitors?' Here, the interrelationships between manufacturer and distributors is a key issue. AHSC's largest customer in the 1970s and 1980s was Johnson & Johnson (J&J), a manufacturer and a distributor of hospital supplies in its own right. However, early initiatives by AHSC were viewed internally within J&J as efforts by one of its leading distributors to better service their ultimate customer, the hospital community. Similarly, *Abbott Laboratories* competed with AHSC only in a relatively narrow segment of IV solutions (specialty products), and otherwise bought much of its glassware (for R&D) and other supplies from AHSC. Thus, initially, J&J and Abbott had little reason to directly counter AHSC's moves regarding computer-based distribution channels for their products.

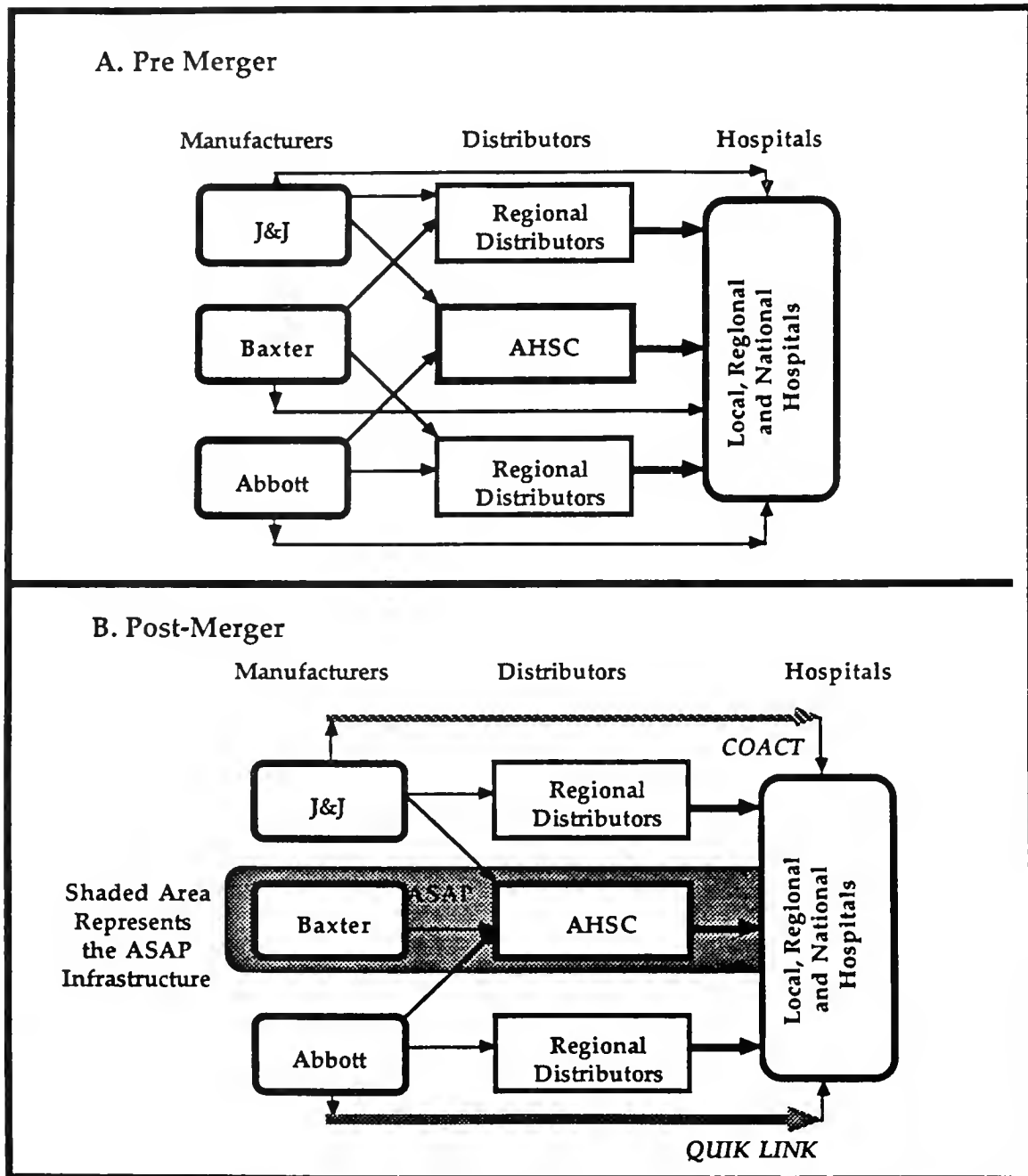
However, the competitive dynamics in the marketplace changed dramatically in 1985 when *Baxter Travenol Laboratories* acquired AHSC. J&J and Abbott (as well as other, smaller hospital supply companies) saw a key competitor, Baxter Travenol,

acquire one of their major distribution channels. Indeed, prior to the Baxter-AHSC merger, J&J and AHSC were complementary in the overall value-creation system. However, subsequent to ASAP becoming a part of Baxter's electronic hierarchy (Malone et. al, 1987), J&J and AHSC's (now Baxter's) previous roles ultimately conflicted with J&J's position in the market. The merger (discussed later) propelled the major hospital supply companies to evaluate seriously the need to develop competing electronic manufacturing and order entry systems. Indeed, during the 1984-1986 period, several suppliers (Bard, 3M, Monoject, J&J's Patient Care and Orthopedic divisions) pulled their products from the AHSC distribution network²⁰. Figure 3 is a schematic representation of the role of ASAP before and after the Baxter-AHSC merger. It highlights the creation of an electronic hierarchy in the form of Baxter International that controls a significant proportion of the manufacturing and distribution of hospital supplies.

A final point to be made here is that while J&J realized the importance of the ASAP system in the shifting hospital supplies marketplace, the firm had a major, internal organizational struggle to develop its own centralized order entry system -- one that was counter to J&J's organizational culture of highly decentralized operations. Indeed, the difficulty was in developing a centralized distribution and responsible for collectively (and seamlessly) supplying a set of products from a multitude of decentralized J&J business units.

Baxter--AHSC Merger: Acquiring Distinctive Competencies? By the early 1980s, AHSC was an attractive merger or acquisition target, due in large part to its computerized support for distribution. In 1985, Karl Bays supported a proposed merger between AHSC and the Hospital Corporation of America (HCA), which at the time was the largest, for-profit hospital management company. Although management committees at both HCA and AHSC approved, hospitals outside of the HCA network objected, since a major channel for their own hospital supplies would potentially be through HCA - a competitor. Moreover, many of the objecting hospitals were themselves large AHSC customers, and ultimately the proposed merger collapsed (Main and Short, 1989). Subsequently, Baxter Travenol Laboratories, a large healthcare manufacturer, made an unfriendly but successful takeover bid for AHSC, and the new entity, Baxter International, was created in November 1985.

Figure 3: The Role of ASAP Before and After the Baxter-AHSC Merger



Had it succeeded, the HCA-AHSC merger would have created an electronic hierarchy composed of a care provider and a hospital supplies distributor that controlled upstream activities. Conversely, the Baxter-AHSC merger, composed of a manufacturer and a distributor, created an electronic hierarchy controlling downstream activities (see Figure 3). While many competing hospitals objected to the former, the latter created major pressures for competing manufacturers. In

addition to the ASAP's system capabilities, the combined Baxter-AHSC organization had dominant market share positions in several significant product-lines. Table 3 is a partial listing of these product-lines.

While we do not intend here to analyze the *pros* and the *cons* of the Baxter--AHSC merger, we do argue that the merger signified a strategic move by a manufacturing firm seeking to control the dominant electronic distribution channel with the hospitals. Since the marketplace had accepted the 'prime vendor' concept, Baxter Travenol's success before the merger critically depended on its available product scope and its access to AHSC's electronic distribution channel. Moreover, given the penetration levels achieved by ASAP over the 1965-85 period, it would have been difficult, if not impossible, to create a competing electronic channel. Thus, an aggressive strategy anchored on acquiring control of AHSC and the ASAP channel was seized upon²¹.

Table 3: Market Positions After the Merger

Product Line	AHSC Share (%)	Baxter's Share (%)	Combined Share (%)	Market Position
Solutions	--	30.8	30.8	1
Parental Supplies	--	18.8	18.8	2
Medical Supplies	15.2	--	15.2	1
Garments & Textiles	31.0	--	31.0	1
Disposable Kits & Trays	24.9	3.0	27.9	1
Catheters & Tubes	21.2	1.2	22.4	1
Respiratory therapy	20.0	7.0	27.0	1
Surgical Packs	50.4	--	50.4	1
Urological Packs	16.1	9.9	26.0	2
Gloves	--	28.5	28.5	1
Maternity products	40.8	--	40.8	1
Elastic Bandages	11.5	--	11.5	3
Dietary Supplies	30.2	--	30.2	N/A
Dialysis Supplies	--	28.7	28.7	1
Identification Supplies	14.7	4.2	18.9	2
Total Market	13.1	7.4	20.7	1

Note: These are market shares for the hospital sales only and does not include sales to non-hospital markets

Source: *Health Industry Today*, February 1986, page 25.

In discussing the merger, Karl Bays remarked, "Both companies have similar customer bases. American over the years had invested in a distribution system and remote order entry system that clearly will be of help to Baxter." Vernon Loucks, Chairman of Baxter Travenol Laboratories, remarked: "American offered us all the

pieces that we were missing ... to remain competitive²² – a reference to the ASAP distribution channel.

The importance of ASAP in the merger is further highlighted by noting that AHSC's IS executive group was put in charge of Baxter's new IS organization. Moreover, the ASAP platform served as the electronic pipeline for a substantial portion of the new company's post-merger business strategy (Main and Short, 1989).

Continuing System Enhancements by Baxter. Subsequent to the merger, Baxter continued to emphasize system enhancements. Table 4 summarizes the additional features included in later versions of ASAP.

Table 4: A Summary of Continuing System Enhancements (1985-1990)

System (Date Introduced)	Distinctive Features	Technology at Hospitals	Technology at AHSC
ASAP 5 (1985)	Off-line order creation	Micro-computer with modem	Front-end communication development
ASAP 8 (1986)	Electronic Invoicing/electronic funds transfer	Purchase order matching application; electronic invoice and receipt	X.12 management software; application mapper
ASAP Express (1988)	All-vendor PC based EDI package using X.12; mainframe X.12 interface	Micro-computer with modem; X.12 on mainframe	Security enhancements; application work; additional X.12 flexibility.
ASAP Express PowerBase (1990)	All-vendor computer assisted purchasing	386 micro-computer with modem	Applications enhancement

The Movement Towards an Electronic Market for Hospital Supplies. A critical question at this stage is: will the business relationships established with proprietary systems move towards a common electronic distribution network? By one account, by 1988 there were already over 50 different order-entry/materials management systems in the marketplace (Scott, 1988). Since from the point of view of the hospitals, efficiency in order-processing decreases with multiple, incompatible systems, hospitals increasingly have demanded the establishment of a common, order-entry platform. More than a decade after the introduction of ASAP 1, and several years after smaller, regional competitors imitated ASAP with their own versions of proprietary order-entry systems, both Johnson & Johnson and Abbott Laboratories introduced their own versions of proprietary, *multivendor* systems: J&J's *Cooperative Action Plus* (COACT) and Abbott's *Quik Link*.

COACT, for example, first introduced in July 1985, is a sophisticated computer-based logistics system designed to make it easier and more economical for

hospitals to do business with J&J. Features such as online order inquiry and consolidated reporting are combined. More specifically, COACT brings together 15 J&J companies, hitherto distributing their products separately, onto one system. COACT PLUS, introduced shortly thereafter, offered a centralized gateway to J&J products as well as to products from selected other vendors. Additional system-related features included; ability for the hospital to use a few custom codes to generate purchase orders, rather than manually entering full orders; a data base manager which tracks all the products purchased by the hospital; and telecommunications services with several vendors.

In October 1987, 3M Company and Abbott Laboratories announced a jointly developed, competitive electronic order entry system named *Quik Link*. This system had the following key capabilities: multi-vendor remote ore entry capability; consolidated product deliveries; and centralized customer service. The alliance between the two companies ensured economies of scale in both product line availability and technology - essential requirements for competing - even if a late entry - in this marketplace.

These moves to provide common gateways reflect competitor attempts to match Baxter's broad product scope and high penetration rate for terminals in the hospitals (Baxter's ASAP systems are in approximately 65%-70% of all major (over 200-bed) hospitals). Other, earlier, and relatively weak proprietary systems offered by smaller competitors failed due to Baxter's extensive product line, the high levels of ASAP penetration, and continual modifications and upgrading of ASAP systems by Baxter to improve ease of use, functionality and cost. By April 1988, however, both Abbott and J&J offered over 30 vendors on each of their respective systems, significantly broadening their product scope and thus attempting to compete head-on against Baxter.

Baxter responded quickly to these competitive moves. Pressure had also been building on the customer side -- hospitals faced the option of converting over to COACT or *Quik Link* or, worse, running all the systems in parallel. To keep in step with the market, Baxter announced *ASAP Express* in June 1988-- its version of a multivendor system, with 8 vendors initially on the system. *ASAP Express* extended Baxter's proprietary network to include other network providers, including GEISCO and McDonnell Douglas, who provided global telecommunications services and an electronic clearinghouse for the other 8 participating vendors. ANSI X.12 standard formats were adopted for all communications with the co-vendors. As Sue Scott, Director of ASAP Systems has

noted: "Baxter is now more globally defining ASAP as automated communications rather than just automated order entry. We realize that the life of vendor-discrete systems -- at least those in healthcare -- is limited. We are purposely following the successful example of American Airlines' moving into the all-vendor arena²³. Moreover, our customers of course continue to shape our ASAP future. Their needs involve all areas of their management responsibilities, not just order-entry²⁴."

Like all proprietary systems -- even if multivendor, however, *ASAP Express* is 'biased' in that price and product availability are carried only for Baxter's and co-vendors' product lines. True price-comparisons between competing product lines and vendors are not possible on-line (unlike the airline reservation systems which will display such information). Following Williamson (1985) and Malone et al. (1987), we note that there is a movement away from electronic hierarchies in this industry (i.e., proprietary ASAP 1- ASAP 4 systems), and towards a 'biased' electronic market (e.g., a few, relatively large multivendor systems). Simultaneously, on the customer side, hospitals themselves are investing in their own materials management systems. Consequently, there are strong pressures to reduce the 'bias' in multi-vendor systems for purely product exchanges, and move instead towards a common network infrastructure. However, because this market depends crucially on value-added, materials management services as well as product sales, it is still unclear how or when this market will evolve into an electronic marketplace with largely price-based exchange.

p Thus, this phase reflects *competitive jockeying to control distribution channels, and the movement from electronic hierarchies to both biased and unbiased electronic markets.*

Synthesis of Era One

It is clear that the business relationships built between Baxter and its hospital customers around the ASAP platform were instrumental in radically transforming the hospital supplies marketplace over the past two decades. The focus of the ASAP system evolved from an operational emphasis on order-entry and service level reporting back to the hospital, to one focused on service quality, cost management and value added materials management services. Specifically, the ASAP technology platform has shifted away from dedicated systems with proprietary protocols towards a common electronic data interchange (EDI) platform, with gateways to third-party vendors like GE Information Systems Company (GEISCO), McDonnell Douglas, IBM, and other value-added networks. Certainly, by the end of this era a

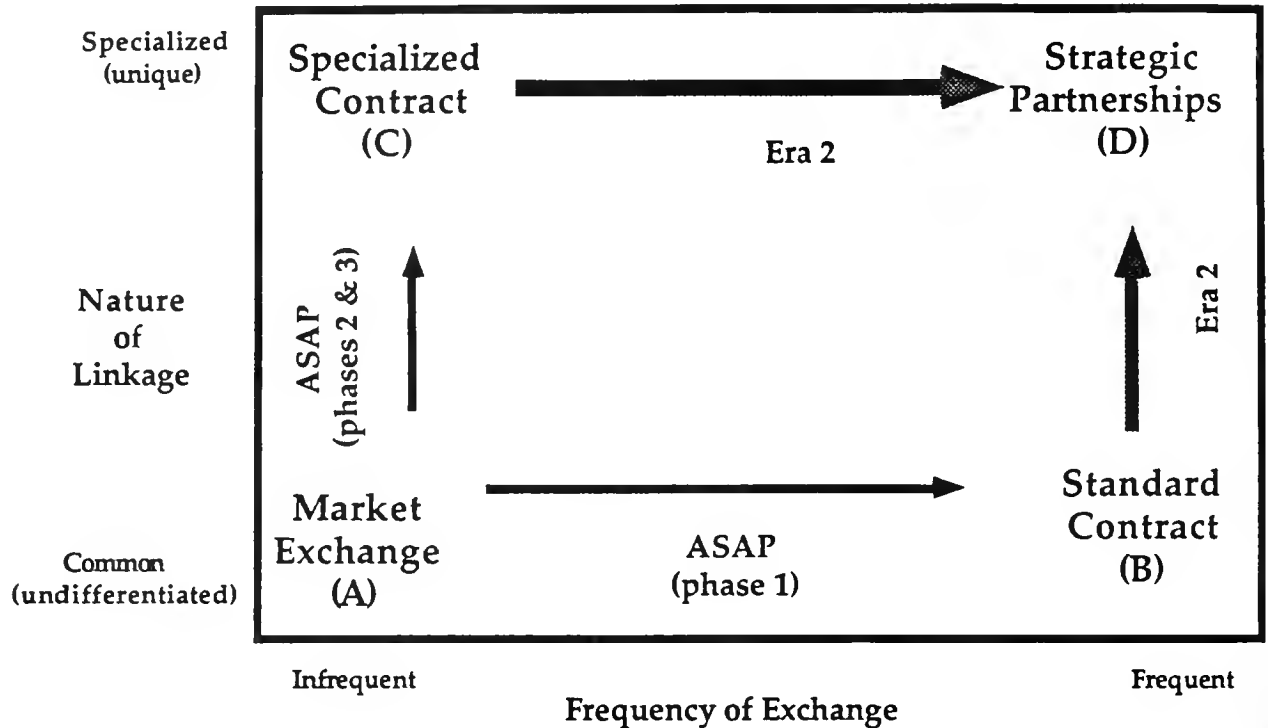
computer-based, order-entry communications system was a 'strategic necessity'²⁵ for effectively competing in this marketplace.

Figure 4 presents a framework to help formalize the shifts in business relationships among the key players. It builds on Williamson's (1985) work identifying different modes of exchange and governance of these exchanges. Venkatraman and Kambil (1990) have adapted this work to help analyze the transformation in relationships mediated by information technology. Our point here in positioning the transformation of business relationships within a framework on interfirm, market-based transactions is to integrate the former with that of the information system supporting the business relationship. Referring to Figure 4, the vertical axis depicts the nature of the linkage between Baxter and the hospitals (unique versus undifferentiated), while the horizontal axis represents the frequency of exchange (frequent versus infrequent).

A common linkage with infrequent exchange is termed *market exchange* (A). This represents a typical transaction between AHSC and a hospital at the time the *Tel-American* system was introduced in 1963. A common linkage with frequent exchange is termed *standard contract* (B). By increasing the frequency of exchange through value-added reporting back to the hospitals, AHSC ensured that hospitals would tend to consolidate their purchases with AHSC to realize maximum value from the monthly report provided.

The third type of relationship is differentiated linkage with infrequent exchange, termed *specialized contract* (C). Here, unique resources were committed by Baxter in phases two and three to develop procedures and specific technology interfaces customized to each hospital. In addition, direct mainframe-to-mainframe links implemented in ASAP 4 was another manifestation of this type of relationship. The point to be made here is that transformations in business relationships from type (A) to types (B) and (C) were inherently rooted in the successive versions of the ASAP platform.

Figure 4: The Evolution of Relationships Between AHSC/Baxter and the Hospitals



In contrast, the fourth type of relationship is characterized by frequent transactions with specialized exchange termed *strategic partnerships* (D). This type requires a fundamental redefinition in the nature of the business relationship between Baxter and the hospitals -- away from a 'buyer-seller' relationship, and towards one of 'partnership²⁶.' Here, the basis of competition shifts away from a dedicated, proprietary order-entry system (ASAP 1) towards one where value-added services are provided by leveraging the information content of specialized exchange. This type of relationship is exemplified by Baxter's new *ValueLink* business program -- where both Baxter and the hospital work to increase the efficiency of the dyad by reassessing their respective roles, business processes and procedures. This transformation marks the beginning of the second era, where the ASAP system is a 'necessary but not-sufficient' condition for developing and implementing Baxter's partnership strategy.

Era Two: Strategic Transformation

The challenges pertaining to both business strategy and technology facing Baxter and its competitors in 1990 are qualitatively different from those of the evolutionary perspective underlying the first three phases. In the following paragraphs, we discuss this second era, termed strategic transformation, in terms of (a) shifts in business competences; and (b) shifts in business network roles.

Shifts in Business Competences. In the second era, the distinctive business competency shifts from the efficient distribution of products through automated order-entry to delivering an integrated materials management service guaranteeing product availability as well as information-based logistics services. While success in the first era depended on a firm's ability to carry a wide product range to support the prime vendor concept, success in the second era will depend on a firm's ability to control and exploit key attributes of information flows underlying the business exchange with the hospitals. This implies that a firm with the capability to provide a broad product-line from multiple vendors, just-in-time delivery and logistics management to the hospitals will succeed relative to those competitors without such competences.

Consequently, access to ordering information through dedicated systems such as ASAP versions 1 through 8 is less central than the ability to leverage multiple channels of communication between manufacturers and hospitals (i.e., phone, terminals, standing orders, etc.) to provide management services back to the hospitals. Indeed, as we noted earlier, it was clear within Baxter/AHSC even in the early phases of ASAP that the critical business competence lay not in dedicated 'lock-in' systems for order-entry, but in AHSC's ability to provide value added services that leveraged the information content of exchange. However, the market for these services (i.e., hospital demand) and AHSC's and Baxter's evolution of service capabilities did not occupy a central position until their announcement of Baxter's *ValueLink* program in 1990.

The beginning of the second era is marked by the deployment of *ASAP Express PowerBase* (introduced in 1990) -- a system capable of connecting the hospitals directly to multiple vendors. *ValueLink* is a specific business relationship building on the ASAP platform and providing Just-In-Time (JIT) delivery to the hospital. *ValueLink* is defined by Baxter as "a logistics capability, based on integrated information management, that delivers products on a 'Just-In-Time' basis in a ready to use package for specified user departments²⁷." In simple terms, it is an integrated

logistics system synchronizing the flow of products and information between the customer and Baxter via consolidated purchases (e.g., prime vendor) and multiple deliveries to point-of-use in the hospital seven days a week. This business program has the potential to reshape traditional conceptualizations of control and coordination in customer--supplier relationships in areas such as initiating purchases, inventory control, monthly invoicing and payment. As Baxter and hospitals become more interdependent via *ValueLink*, greater trust and understanding between them will be required to sustain and manage the 'strategic partnership' (Figure 4).

The success of the partnership requires that each hospital commits to a long term contract (minimum five years)²⁸ for purchase volume as well as a high share of product flow with fees for value-based services. Baxter, on the other hand, commits to a 100% fill rate, lowered inventory levels (and associated operating and fixed costs), in addition to developing customized procedures to ensure delivery to multiple, distributed user departments (i.e., operating rooms, laboratories, X-Ray units, etc.). Since this requires Baxter to distribute a broad product-line, including those of its competitors, it is particularly significant that they have obtained limited rights to distribute products from over 400 manufacturers who traditionally have not distributed through Baxter's Hospital Supply Division²⁹. It is also interesting to note, however, that Abbott, 3M Co., and certain J&J companies have to date refused to sell their products through the *ValueLink* program, thus highlighting the importance of product breadth, rather than order-entry, as the critical business competence in the changed marketplace.

Nevertheless, Baxter's leading position in the marketplace affords them numerous advantages. In commenting on the benefits of the *ValueLink* program, Warren Rhodes, President of Mercy National Purchasing Inc., noted: "The value-added service feature is one of the keys to this agreement. With Baxter's help in logistics and inventory management, as well as strategic consulting.... we can better define and control our expenses and provide more cost-effective patient care³⁰." In a similar vein, Anthony Kesman, Vice President and General Manager of *ValueLink* business program remarked that: "Hospitals spend more than one-third of their budgets divided equally between purchasing supplies and moving them from their warehouse to their patient; with the *ValueLink* program, they can reduce their inventory levels significantly without the danger of running out of supplies³¹." The underlying business rationale for *ValueLink* is that the overall efficiency within the manufacturing-distribution-customer chain increases as the distributor assumes

inventory and distribution functions, in exchange for customer purchase commitments. More importantly, Baxter's source of distinctive business competence lies in their ability to rapidly collect and process relevant materials information, since inventory levels are directly related to the quality of information, and in particular, to the degree of uncertainty.

Table 5 summarizes the details of six major *ValueLink* contracts. These contracts highlight the 'partnership' nature of the relationship between the hospitals and Baxter. Overall, Baxter's set of business competences has shifted away from a focus on economies-of-scale (i.e., efficient, standardized, low-cost distribution) and towards economies-of-scope (i.e., providing customized, materials management services through a combination of product scope and information scope).

Shifting Business Network Roles. Beyond the *ValueLink* program offered by Baxter, and several competing programs offered by regional competitors, this era is marked by fundamental shifts in the *business roles* of the key players in the marketplace. Specifically, the roles of manufacturer, distributor, purchaser, information systems provider, and materials manager are blurring in radical ways. In the first era, the primary role of AHSC was one of a full-line *distributor* of products, whose suppliers included J&J, Abbott and other hospital supply manufacturers. Thus, AHSC's attempts to leverage ASAP to increase its competitive position *vis-a-vis* other distributors was not a major concern to the manufacturers. From the hospital point of view, ordering via the ASAP system saved administrative costs, inventory carrying costs, and provided valuable service level reports back to hospital management. These could not have been duplicated as efficiently within the hospitals.

Baxter emerged from the 1985 merger as a leading manufacturer and distributor of over 70% of hospital needs. AHSC was a key supplier for Abbott and a key distributor of J&J products, but the merger has shifted the firm to that of a direct competitor. These changes are fundamentally transforming the structure of business relationships in the marketplace. Competitive success in this market depends critically on making appropriate changes to the set of business and organizational competencies required for repositioning.

Table 5: Details of Major ValueLink Contracts Between Baxter and Hospitals@

Hospital	Date	Duration of Contract	Projected Savings to the Hospital	Benefits to Baxter
St. Paul-Ramsey Medical Center, St. Paul, MN (435 bed)	1988	(pilot)	\$580,000 in operating costs; plus 5400 sqft space savings; service level 99%	(company confidential)
Vanderbilt University Hospital (587 bed)	1988	5 Years	labor savings of over \$750,000; inventory savings of over \$ 3 million in 2 years	(company confidential)
St. Luke's Episcopal Hospital, Houston, Texas (949 bed)	May 1988	(pilot)	One time savings of \$1.3 million; plus 11,000 sqft space; annual \$1 million operating savings; service level 99%	(company confidential)
Mercy National Purchasing, Inc. (102 hospitals; and 20000 beds)	February 21, 1990	5 years	20% savings in total inventory carrying costs	projected sales of \$700 million
Hospital Corporation of America; Healthtrust Inc., HCA Management Corporation (452 hospitals)	December 27, 1989	6 years	(not available)	projected sales of \$2.5 billion
Presbyterian Hospital of New York, NY	August 1, 1990	5 years	Annual savings of \$2 million	\$100 million incremental sales over 5 years

@ – Compiled from various Business Wire Reports for illustrative purposes.

Further, with the introduction of *ASAP Express* and *ASAP Express Power Base* in early 1990, Baxter is steadily assuming the role of an information gateway. With the launch of the *ValueLink* program later in 1990, Baxter is assuming a still greater role as a materials manager for the hospital. To illustrate the point, consider the case of the ValueLink contract with Vanderbilt University Hospital (see Table 5). Here, Baxter is in the midst of moving its own staff into the hospital to manage the flow and restocking of supplies. Vanderbilt has sold or leased its stock of supply carts to Baxter, while Baxter is reconfiguring part of its Nashville warehouse to accommodate the hospital's goal of delivering to each category of end-user the

required units for use. Such an arrangement redefines the traditional role of a distributor, requiring greatly increased levels of trust and mutual dependence³².

Baxter's role redefinition extends beyond changes in traditional supplier-customer roles along a vertical continuum of hospital supplies. Reflecting a strategy of providing a broad line of value-added services, Baxter has entered a 50-50 partnership with IBM to form a health-care information management company, *Spectrum*, to sell computer hardware, software and information services to hospitals and physicians³³. Moreover, the company also has entered into partnerships with *Kraft* for providing hospital food services, *Comdisco* for providing strategic consulting for acquisition of capital equipment, and *Waste Management Inc.* for providing efficient disposal of hospital wastes.

Thus, we observe Baxter repositioning itself in a dual-role in the marketplace: one of a 'value-added' partner capable of providing a wide range of value added services (examples: capital equipment acquisition and utilization; materials management providing JIT delivery and integrated logistics services through the *ValueLink* program), and, second, continuing to leverage the installed ASAP platform as a gateway to both Baxter's and co-vendor's broad product lines. While it is clearly premature to assess the efficacy of this multi-faceted strategy, it is important to recognize that Baxter's role in the marketplace today is significantly different from its previous role in phase one as a full product-line distributor with the capability for automated order-entry.

- p The second era, thus, is characterized by a *greater attention to the fundamental business requirement of providing a set of materials management and logistics services to the hospital marketplace and the consequent transformation in the role of information technology in enabling the company to implement this capability.*

Management Implications and Conclusions

We build here from previous sections to develop a set of issues on effective strategies for electronic integration emerging from this case research. We first compare our four phases along a set of critical business, organizational, and technology dimensions and then derive a set of strategies for electronic integration.

Comparison Across the Four Phases

In Table 6, we compare the four phases along a set of key dimensions. We reiterate the importance of noting that during ASAP's nearly three decade evolution, the distinctive business competence shifted from one of providing efficient, full-line distribution service on a national scale (economies-of-scale), to one of providing integrated materials management services leveraging the information content of exchange through a tightly-knit value-added partnership (economies-of-scope). Simultaneously, the distinctive systems competences evolved from providing efficient telecommunications between AHSC and the customer for order-entry, to one involving a complex, inter-organizational technology platform capable of exchanging more detailed information among a network of partners. Several systems other than ASAP are in the marketplace today, but at the end of three decades of use, ASAP still occupies a dominant position. However, its functionalities and the nature of the business relationships between Baxter and its suppliers and customers have changed dramatically. It is interesting to note, however, that ASAP still occupies a central role in the complex set of changes that have occurred in this marketplace over the four phases identified in this paper.

Table 6: Comparison Across the Four Phases of Evolution

Key Characteristics	First Era			Second Era
	Phase 1	Phase 2	Phase 3	Phase 4
Distinctive Business Competence	National, Full-line, Efficient Distribution Service	National, Full-line, Efficient Distribution accompanied by aggressive deployment of ASAP	Broad line manufacturing and full-line distribution; market dominance	Broad-line manufacturing and full-line distribution; plus materials management and logistics services
Business Role	Distributor	Prime Vendor	Manufacturer and Distributor ³	Value-added Partner
Distinctive Systemic Competence	Communication Protocols	Dedicated System	System Integration	Joint Application Development
Company-Customer Relationship ¹	Market Exchange	Standard/Specialized Contracts	Specialized Contracts	Customized Relationships
Company-Supplier Relationship	Mutual dependence		Competitive; adversarial	Competitive → Collaborative
Competitive Posture	Fragmented, Local Competition	Fragmented, Regional Competition	Redefined National Competition	Repositioned Competitive Arena
Major Systems in the Marketplace	Tel-American	ASAP	ASAP; COACT; QUIK LINK	ASAP Express; VALUELINK; COACT; QUIK LINK
Effect of the system on the Hospital Processes ²	Procedural Asset Specificity (order protocols)	Procedural and Technological Asset Specificity (ordering protocols and specialized terminals)		Co-specialized assets and knowledge (materials management)
Systems Effect ⁴	Communication effects		Brokerage effects	Process integration effects
Organizational Challenge	Localized response from field initiatives	Corporate response from regional initiatives	Internal business integration (post-merger roles and linkages) ³	External business integration (redefinition of roles and linkages)

¹ --see Figure 4; ² See Williamson (1985) for details; see also Figure 4; ³ -- mainly due to the Baxter-AHSC merger; ⁴ -- see Malone et al (1987) for details.

Strategies for Electronic Integration

I. Strategies for Electronic Integration: Proactive Shifts in Emphasis. A key theme emerging from this case is the proactive way in which Baxter/AHSC's strategies for electronic integration shifted over time. The early years were marked by a 'business-led IT response' -- namely: the design of the dedicated, proprietary ASAP system to support an overarching business strategy of an efficient, national-scale, full-line distributor of hospital supplies. Successive versions of ASAP were modifications to the technology platform to derive distinctive business competencies for Baxter/AHSC. However, as the marketplace shifted under increasing pressure from the hospitals and competitors for a common electronic infrastructure, Baxter shifted its emphasis away from dedicated systems to providing a multivendor platform that leveraged its installed terminal base. Simultaneously, Baxter offered the *ValueLink* program -- one that builds on ASAP to offer new logistics and materials management services. Certainly materials management as a value-added service is not new to the industry, but Baxter's offering is distinguished by its ability to leverage (a) its product scope; and (b) its information technology base, allowing Baxter to offer services at a price and quality level that may be difficult to compete with. Baxter/AHSC's proactive strategy to continually change the 'rules-of-the-game' in this fast changing marketplace is particularly characteristic in this case setting.

II. Strategies for Electronic Integration: Redefining 'Locus of Business Competence.' It has been observed that information technology has the power to change firm or industry-level competitive characteristics (see for instance, McFarlan, 1984). We find that this case is a powerful way to highlight one aspect of these changes: the redefinition of the 'locus of business competence' in the marketplace. For example, in the early days AHSC's business competence lay in its efficient distribution. J&J and Abbott excelled in manufacturing hospital products, while IBM provided the bulk of hardware, software and communication capabilities. Electronic interconnections among the key players, however, have fundamentally redefined this 'locus of business competence.'

Extending the arguments made on technological discontinuity (see for instance, Tushman and Anderson, 1986), we argue that electronic integration potentially affects business competences in three ways: (a) competence-creating; (b) competence-enhancing; and (c) competence-destroying. At one end we identify *competence-creating* -- manifested in the new role for integrated materials and

logistics management around ASAP. As noted earlier, while materials management services within hospitals could be provided by someone other than a distributor, Baxter's ability to provide JIT delivery and to help hospitals attain lower overall inventory costs creates a new source of distinctive competence, and thus differentiation in the marketplace.

At the other end we identify *competence-destroying*. This posits that electronic interconnection can render some of the traditional sources of business competencies irrelevant. We see this in the gradual disappearance of strong regional and local competitors in a marketplace that now requires centralized coordination of a broad range of services. Finally, the third category -- *competence-enhancing* -- is somewhere between competence-creating and competence-destroying. IBM, for instance, is in a position to enhance its business competencies to serve the healthcare market by virtue of its alliances with a variety of healthcare players including Baxter, Abbott and 3M. Indeed, as the market shifts away from its traditional product-based roots towards a greater emphasis on information-based services, IBM's set of business competences necessary to compete in this market will be enhanced. Our overall point is that different phases of electronic interconnection will create new sources of business competencies, enhance some existing ones, destroy others. This requires business managers to go beyond assessing operational efficiency and/or effectiveness and identify new sources of competitive advantage.

III. Strategies for Electronic Integration: Reconceptualizing Business Relationships. Finally, the ASAP case highlights the need to view electronic integration in terms broader than simple electronic data interchange. If we had focused our attention mainly on the system characteristics, we might have concluded our discussion at the end of the third phase, in other words, with the emergence of a multivendor, electronic infrastructure. However, electronic integration needs to be viewed in business terms, and consequently, the implications of such interconnectivity for changes in the nature of business relationships should be assessed. We believe that Baxter's business strategy has been to continually redefine the nature of the business relationship (efficient distributor to prime vendor to electronic distribution channel to value-added partner). This business strategy viewed ASAP as a means, not an end in itself.

Summary

This paper analyzes the evolution in strategies for electronic integration at AHSC and Baxter Healthcare over the past thirty years. Our research indicates that this evolution is best viewed in terms of two different eras: the first ending during 1987-1988. The second era is just emerging. Baxter successfully dominated the first era and as a result, is well positioned to exploit the opportunities offered in the second.

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Appendix 1: A Brief Description of the Case Research Methodology

We describe our case study research methodology in terms of the eight steps outlined in Eisenhardt (1989) for building theories from case study research. The philosophy of case research underlying these steps is consistent with the current thinking on scientific research, and this set of steps best helps us to describe our approach.

I. Getting Started. This step involved the definition of research question and possible prior constructs. Specifically, we framed the research question in terms of understanding the evolution of Baxter's ASAP system in its broader context of environmental, organizational, technological and competitive characteristics.

II. Selecting the Case. Since it is one of the 'popular' cases of strategic benefits from IT (especially since two others have been previously subjected to detailed assessments), we selected the hospitals services market.

III. Crafting Protocols and IV. Entering the Field. Our approach was to adopt multiple data collection methods involving both qualitative and quantitative data. Two different investigators collected data from several sources: customers, company, archival records, secondary data on market trends, etc. The use of diverse sources helped us strengthen our conviction in the conclusions;

V. Analyzing the Data. Our approach was essentially to carry out 'within-case' analysis to ensure internal consistency and validity of our interpretations and conclusions. We had constant feedback discussions with multiple managers at Baxter to validate our interpretations. The arguments presented in this paper reflect our analysis of the data that have been discussed (but not necessarily endorsed always) by the internal managers.

VI. Shaping Hypothesis and VII. Enfolded Literature. Although inductive, we develop our arguments in the paper that are congruent with relevant bodies of theory such as Williamson's modes of governance.

VIII. Reaching Closure. Our belief is that we have been able to offer adequate insights in relation to the first era of evolution and have raised a set of interesting issues for the second era -- which is just unfolding. It is an interesting setting to continue further and assess Baxter's capability to compete effectively in the changing marketplace.

Notes

¹ Although we recognize the need to distinguish between the IT infrastructure from Information Systems (IS), for the purpose of this paper, we treat them as synonymous.

² Examples of products, systems and services within each of the four industry segments include: within Hospital Products and Services; Medical Products, Parenteral Products, and Distribution Products; within Medical Systems and Specialties, Blood Therapy, Diagnostics, Medical Specialties Devices, and Health-Care Services; within Alternate Site Products and Services, Home Health-Care and Health Cost Management; and within Industrial Products, laboratory supplies and industrial apparel.

³ Baxter Annual Reports, 1987, 1988, 1989.

⁴ Konsynski, Benn and Vitale, Michael, "Baxter Healthcare Corporation: ASAP Express," Case Number 9-188-080, Harvard Business School, Rev. 7/9/90.

⁵ Interviews and discussions with Mr. Carl Steiner.

⁶ Interviews and discussions with Mr. Carl Steiner.

⁷ An important decision for instance, while the IBM system 1001 was central to the AHSC-Tel American initiatives, IBM elected in the mid-1970s to discontinue the system 1001. Since AHSC's business strategy was intricately linked to this technology and IT architecture, the company decided to acquire a technology unit, *TekPro*, as a part of its corporate portfolio. The *TekPro* division developed an information system that could acknowledge the receipt of each line of data from the hospitals – thus ushering in the era of two-way, computer-based communications, or more formally, the electronic integration of multiple independent hospitals with AHSC.

⁸ Interviews with Baxter managers conducted by the authors.

⁹ An American Hospital Association Study identified that a typical 250-bed hospital in 1981 had an operating budget of \$90,000 per bed per year, and that the average supply expenditure was \$18,862 per bed per year. Assuming a dollar-for-dollar relationship between cost of supplies and logistical support for those supplies, materials management had responsibility for 40% of hospitals operating budget. [Source: Password, AHSC Publication.]

¹⁰ Interviews with former AHSC personnel. These services were initially provided free to the hospital. As demand for the service grew, it was later provided to customer as part of volume purchasing agreements between AHSC and the hospital.

¹¹ Interviews and discussions with Mr. Michael Heschel conducted by the authors.

¹² For an elaboration of the general concept of asset specificity, see Williamson (1985); for an exposition on the role of asset specificity in interfirm governance mediated by information technology, see Malone et al (1986); Clemons and Row (1989).

¹³ For an overview of first-mover advantages, see Lieberman and Montgomery (1988).

¹⁴ Interviews with Baxter and former AHSC personnel. The actual number of these systems installed in hospitals is difficult to ascertain, though probably never exceeded 20-30 at any one time. The difficulty in saying precisely there were "x number of systems" is that hospitals were experimenting with different supplier services. It was not unusual for a hospital to try one or another of the systems available for a short period of time before settling on the preferred vendor.

¹⁵ In our interviews, Steiner emphasized the importance of AHSC's broad product line rather than the technology linkage by noting: "It always amazes me that even today we still hear talk about locking customers in with technology. In fact, the customer requirements we were dealing with at the time were for us to help provide them with a very simple device, one very easy to understand and implement (in what was still a largely clerical function), and, above all, it had to be very inexpensive. We certainly did not view this kind of device as anything more than an opportunity to show the customer we had the product line to simplify their ordering process."

¹⁶ Interviews with hospital personnel and former AHSC executives.

¹⁷ See MacMillan and McCaffery, 1982 for a discussion of inertia barriers.

¹⁸ White & White, Inc. et. al versus American Hospital Supply Corporation. US Court of Appeals for the Sixth District, December 16, 1983. (court docket),

¹⁹There is similarity here to the *Frontier Airlines* suit in 1983 charging *United Airlines* – the owner of the APOLLO reservation system -- with unfair trade practices, which was also eventually decided in favor of the defendant, *United Airlines*.

²⁰Bays, Karl and Vernon Loucks, interviewed by David Cassak. "The New Baxter Travenol – Life with American Hospital Supply Corporation," *Health Industry Today* (February 1986), pp. 16-26.

²¹Recall that in the case of airline reservation systems, the top two systems (American's *SABRE* and United's *Apollo*) control over 50% share of all travel agency terminals, thus returning differential benefits over those with smaller systems. Indeed, the general feeling is that competition in the airlines industry is occurring at the level of the travel agencies and terminals, and access to timely information of airline operations.

²²Interview with David Cassak, Editor of *Health Industry Today*, February 1986, page 17.

²³For more details on American Airlines' strategy regarding *SABRE*, see Hopper (1990).

²⁴Interviews with Sue Scott by the researchers.

²⁵We attribute the term to Clemons and Row (1988).

²⁶For discussions on partnership relevant to the present theme, see Henderson (1990); Johnston and Lawrence (1988).

²⁷Baxter internal documents.

²⁸See Joskow (1985) for a formal discussion on the role of contract-duration in interfirm relationships.

²⁹*Hospital Purchasing News*, July 1990.

³⁰Quoted in *Business Wire*, February 21, 1990; section 1.

³¹Interviews conducted by the authors.

³²Wagner, Mary, "Vanderbilt's stockless system relies on distributors as its materials managers." *Modern Healthcare*, February 5, 1990; p 44.

³³*New York Times*, September 22, 1989

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